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(54) Title of the Invention: PROJECTION TYPE DISPLAY DEVICE

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SPECIFICATIONS

1. Title of the Invention: Projection Type Display Device

## 2. Scope of the Patent's Claim

A projection type display device, characterized by the fact that in a projection type of a display device comprising a light source, a transparent type of a display device, and a projection lens, having a reflection means positioned in front of the projection lens, the angle formed between said reflection means and the optical axis is changed in time.

## 3. Detailed Explanation of the Invention

### (Sphere of Industrial Use)

This invention relates to a projection type of a display, which displays video images, computer images, or the like. Among such devices, it relates to projection type display devices using a transparent type of liquid crystal light bulbs, enabling to realize superior contrast with a compact size.

### (Prior Art Technology)

Projection type display devices with the construction described below that use a transparent liquid crystal light bulb have been realized (SID 87 DIGEST, 75 p, Figure 6).

In addition, the design shown in Figure 6 is planned for a commercial design of devices using 70,400 picture elements (pixels).

### (Problems To Be Solved By This Invention)

However, because the transparent type of light bulb with many pixels was used according to the above-mentioned conventional technology (for example a liquid crystal panel or the like), the following problems were encountered.

Specifically, to give an example in case of a liquid crystal panel, the more the number of the pixels is increased, the higher the ratio of increased surface area that will be occupied by the wiring, by TFT, as well as by the gaps between the pixels, etc. When the effective pixel ratio enabling switching of relative light is decreased, it is difficult at the present time to keep this ratio of increase below 50%, for example in case of 211,200 pixels (480 x 440). Accordingly, because the space between the pixels is dark even if the screen status is completely white, ultimately, a pattern having a grid-like shape will be visible.

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In addition, because a similar grid-like pattern is visible also when a video image is displayed, this made viewing very difficult.

The present invention provides a design solving this problem.

#### (Means To Solve Problems)

The projection-type display device of this invention is a projection type display device comprising a light source, the transparent type of a light bulb, and a projection type of lamp, having a projection means positioned in front of the projection lamp, characterized by the fact that the angle formed between said reflection means and the optical axis is changed with time.

#### (Operation)

Because the angle of the reflection means formed with the optical axis is changed with passage of time in the projection type of a display device that is provided with the above-mentioned construction, this makes it possible to change in time also the position of the images on the transparent type of a light bulb when an image is projected on the screen.

This makes it possible to create a stripe shape of the dark region when a grid-like shape was visible on a conventional screen (see Figure 7 for reference). Moreover, because the surface area thereof is also decreased, the result is that the image can be viewed easily.

#### (Embodiment)

The present invention will now be explained in detail with respect to embodiments thereof. However, the embodiments below are not limiting with respect to this invention.

#### (Embodiment 1)

Figure 1 is a diagram explaining the principle of the projection type of the display device of this invention. 1 is a light source, 2 is a collimator lens, 3 is a transparent light bulb, 4 is a projection lens, 5 is a screen, and 6 is a reflection means.

In this case, as shown in Figure 2, the reflection means 6 is provided with an angle formed to the optical axis that is moved so as to create fine oscillations whose size and timing are shown in Figure 3.

The actual construction of the projection type of the display device in the present embodiment is shown in Figure 5. In this case, the projection means 15 is designed so that it can be moved as shown in Figure 1, which explains the principle.

In the present projection-type display device, when NTSC video image signal is supplied, as shown in Figure 4, the dark region that was visible according to prior art as a grid shape (see Figure 7 for reference), will now be formed with a stripe shape. Moreover, the surface area is reduced, and the display visible on the screen can be viewed very easily.

For comparison purposes, Figure 6 is a construction diagram showing a projection type display device according to prior art, and Figure 7 shows the grid pattern displayed on the display screen with a projection type of a display device according to prior art.

In addition, although the present embodiment showed an example in which the stripe pattern was eliminated in the horizontal direction, it is also possible to eliminate the stripe pattern in the vertical direction by moving the projection lens so that the angle is shifted by 90°.

(Effect of the Invention)

Because according to the projection-type display device of the present invention, being a projection-type display device comprising a light source, a transparent type of a light bulb, and a projection lens, having a reflection means positioned in front of the projection lens, the angle formed between said projection means and the optical axis is changed with time, the region that was visible as a grid shape on the screen according to prior art is formed with a stripe shape, while the surface area is also reduced. The effect is that the screen can be viewed easily.

#### 4. Brief Explanation of Figures

Figure 1 is a diagram explaining the principle of the projection type display device of the present invention.

Figure 2 is a diagram showing the relationship between the movement of the reflection means and the movement of the image.

Figure 3 is a diagram showing the movement of the reflection means.

Figure 4 is a diagram showing one example of a display screen in the projection type display device of this invention.

Figure 5 shows the construction of a projection type display device of this invention.

Figure 6 shows the construction of a projection type display device according to prior art.

Figure 7 shows one example of a display screen in a projection-type display device according to prior art.

- |       |     |                             |
|-------|-----|-----------------------------|
| 1     | ... | light source                |
| 2     | ... | collimator lens             |
| 3, 12 | ... | transparent-type light bulb |

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4, 14	...	projection lens
5, 16	...	screen
6, 15	...	reflection means
7	...	pixel
8	...	dark region which appeared in a stripe shape
9	...	light source
10	...	dichroic mirror
11	...	mirror
13	...	dichroic mirror prism
17	...	dark region which appeared in a grid shape

THAT IS ALL

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Figure 1

Figure 2

[bottom part]            optical axis

Figure 3

[vertical axis]            angle  
[horizontal axis]        time

Figure 4

Figure 5

[page 4]

Figure 7